

WHAT IS CLAIMED IS:

1. An air conditioning system for a vehicle having a passenger compartment and a seat provided in the passenger compartment, the air conditioning system comprising:

a space air conditioning unit which introduce conditioned air having an adjusted temperature into the passenger compartment;

a seat air conditioning unit which introduce conditioned air into the seat on which a passenger is seated; and

a control unit which controls the space air conditioning unit and the seat air conditioning unit, in accordance with a detection value of a thermal load of the vehicle, wherein:

the control unit includes

space calculation means for calculating a space target air temperature to be blown into the passenger compartment based on the detection value of the thermal load of the vehicle and a set temperature set by a passenger, and

space controlling means for controlling the space air conditioning unit in accordance with a space control value calculated based on the space target air temperature,

seat controlling means for controlling the seat air conditioning unit in accordance with a seat control value calculated based on the space target air temperature; and

the seat controlling means includes first seat air

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conditioning means which determines the seat control value in a steady air-conditioning state of the passenger compartment, and second seat air-conditioning means which determines the seat control value in a transition air-conditioning state of the passenger compartment.

2. The air conditioning system according to claim 1, wherein:

the space control value of the space controlling means is set based on the space target air temperature in such a manner that an air amount blown into the passenger compartment is increased when the space target air temperature is lower than a first predetermined value or is higher than a second predetermined value higher than the first predetermined value; and

the seat control value of the first seat air conditioning means is set based on the space target air temperature in such a manner that an air amount blown into the seat through the seat air conditioning unit is decreased when the space target air temperature is lower than the first predetermined value or is higher than the second predetermined value.

3. The air conditioning system according to claim 2, wherein the seat control value of the second seat air conditioning means is set based on the space target air temperature in such a manner that an air amount blown into the

seat through the seat air conditioning unit is increased when the space target air temperature is lower than the first predetermined value or is higher than the second predetermined value.

4. The air conditioning system according to claim 1, wherein:

the seat air conditioning unit includes an adjustment member which adjusts a mixing ratio between an air amount of conditioned air from the space air conditioning unit and an air amount of inside air from the passenger compartment;

the first seat air-conditioning means calculates a seat target air temperature based on the space target air temperature; and

the first seat air-conditioning means controls the adjustment member to only introduce inside air of the passenger compartment into the seat air conditioning unit when the seat target air temperature is lower than a predetermined temperature in cooling operation of the passenger compartment.

5. The air conditioning system according to claim 1, wherein:

the seat air conditioning unit includes an adjustment member which adjusts a mixing ratio between an air amount of conditioned air from the space air conditioning unit and an air amount of inside air from the passenger compartment;

the first seat air conditioning means calculates a

seat target air temperature based on the space target air temperature; and

the first seat air conditioning means controls the adjustment member to only introduce inside air of the passenger compartment into the seat air conditioning unit when the seat target air temperature is higher than a predetermined temperature in heating operation of the passenger compartment.

6. The air conditioning system according to claim 1, wherein the first seat air conditioning means stops operation of the seat air conditioning unit when an inside air temperature among the detection value of the thermal load of the vehicle is lower than a predetermined temperature in cooling operation of the passenger compartment.

7. The air conditioning system according to claim 1, wherein the first seat air conditioning means stops operation of the seat air conditioning unit when an inside air temperature among the detection value of the thermal load of the vehicle is higher than a predetermined temperature in heating operation of the passenger compartment.

8. The air conditioning system according to claim 1, wherein:

the seat air conditioning unit includes an adjustment member which adjusts a mixing ratio between an air amount of conditioned air from the space air conditioning unit and an

air amount of inside air from the passenger compartment;

the control unit includes adjusting means for adjusting an operation position of the adjustment member.

9. The air conditioning system according to claim 1, wherein:

the space air conditioning unit has a side face air outlet through which conditioned air is generally always blown toward a side upper side of the passenger compartment when the space air conditioning unit operates; and

the seat air conditioning unit is connected to the space air conditioning unit so that conditioned air of the space air conditioning unit is introduced into the seat air conditioning unit through the side face air outlet.

10. The air conditioning system according to claim 1, wherein:

the control unit has air-conditioning state determining means for determining whether or not an air conditioning state of the passenger compartment is in the steady air-conditioning state or in the transition air-conditioning state; and

the air-conditioning state determining means determines the steady air-conditioning state or the transition air-conditioning state by a steady state discrimination based on the set temperature and an inside air temperature among the detection value of the thermal load.

11. The air conditioning system according to claim 1, wherein:

the control unit has air-conditioning state determining means for determining whether or not an air conditioning state of the passenger compartment is in the steady air-conditioning state or in the transition air-conditioning state; and

the air-conditioning state determining means determines the steady air-conditioning state or the transition air-conditioning state by a steady state discrimination based on the set temperature, an inside air temperature, and a seat set temperature set by a passenger on the seat.

12. The air conditioning system according to claim 11, wherein the air-conditioning state determining means changes a determining value of the steady state discrimination in accordance with a change of the seat set temperature.

13. The air conditioning system according to claim 11, wherein:

the seat set temperature is set by a seat operation member operating the seat air conditioning unit; and

the seat set temperature is a thermal sensation level of a seat surface, which is changed in a range between a cold level and a hot level.

14. The air conditioning system according to claim 1,

wherein:

the control unit includes air-conditioning switching control means which gradually changes the seat control value from a value corresponding to the transition air-conditioning state to a value corresponding to the steady air-conditioning state, at an initial time of the steady air-conditioning state, immediately after the transition air-conditioning state.

15. An air conditioning system for a vehicle having a passenger compartment and a seat provided in the passenger compartment, the air conditioning system comprising:

a space air conditioning unit which introduce conditioned air having an adjusted temperature into the passenger compartment;

a seat air conditioning unit which introduce conditioned air into the seat on which a passenger is seated; and

a control unit which controls the space air conditioning unit in accordance with a space control value calculated based on a detection value of a thermal load of the vehicle, and controls the seat air conditioning unit in accordance with a seat control value calculated based on the detection value of the thermal load of the vehicle, respectively, wherein:

the control unit includes

space calculation means for calculating a

space target air temperature to be blown into the passenger compartment based on the detection value of the thermal load of the vehicle and a set temperature set by a passenger to determine the space control value for controlling the space air conditioning unit, and

seat calculation means for calculating a seat target air temperature to be blown into the seat based on the detection valve to determine the seat control value for controlling the seat air conditioning unit; and

the seat calculation means includes a first seat calculation means which determines the seat control value in a steady air-conditioning state of the passenger compartment, and a second seat calculation means which determines the seat control value in a transition air-conditioning state of the passenger compartment.

16. The air conditioning system according to claim 15, wherein:

the space control value is set based on the space target air temperature in such a manner an air amount blown into the passenger compartment is increased when the space target air temperature is lower than a first predetermined value or is higher than a second predetermined value higher than the first predetermined value; and

the seat control value of the first seat calculation means is set in such a manner that an air amount blown into the seat through the seat air conditioning unit is decreased



when the space target air temperature is lower than the first predetermined value or is higher than the second predetermined value.

17. The air conditioning system according to claim 15, wherein:

the seat air conditioning unit includes an adjustment member which adjusts a mixing ratio between an air amount of conditioned air from the space air conditioning unit and an air amount of inside air from the passenger compartment; and

the first seat calculation means controls the adjustment member to only introduce inside air of the passenger compartment into the seat air conditioning unit when the seat target air temperature is lower than a predetermined temperature in cooling operation of the passenger compartment.

18. The air conditioning system according to claim 15, wherein:

the seat air conditioning unit includes an adjustment member which adjusts a mixing ratio between an air amount of conditioned air from the space air conditioning unit and an air amount of inside air from the passenger compartment; and

the first seat calculation means controls the adjustment member to only introduce inside air of the passenger compartment into the seat air conditioning unit when the seat target air temperature is higher than a predetermined temperature in heating operation of the passenger compartment.

19. The air conditioning system according to claim 15, wherein the first seat calculation means stops operation of the seat air conditioning unit when an inside air temperature among the detection value of the thermal load of the vehicle is lower than a predetermined temperature in cooling operation of the passenger compartment.

20. The air conditioning system according to claim 15, wherein the first seat calculation means stops operation of the seat air conditioning unit when an inside air temperature among the detection value of the thermal load of the vehicle is higher than a predetermined temperature in heating operation of the passenger compartment.

21. The air conditioning system according to claim 15, wherein:

the seat air conditioning unit includes an adjustment member which adjusts a mixing ratio between an air amount of conditioned air from the space air conditioning unit and an air amount of inside air from the passenger compartment;

the control unit includes adjusting means for adjusting an operation position of the adjustment member.

22. The air conditioning system according to claim 15, wherein:

the space air conditioning unit has a side face air outlet through which conditioned air is generally always blown

toward a side upper side of the passenger compartment when the space air conditioning unit operates; and

the seat air conditioning unit is connected to the space air conditioning unit so that conditioned air of the space air conditioning unit is introduced into the seat air conditioning unit through the side face air outlet.

23. The air conditioning system according to claim 15, wherein:

the control unit has air-conditioning state determining means for determining whether or not an air conditioning state of the passenger compartment is in the steady air-conditioning state or in the transition air-conditioning state; and

the air-conditioning state determining means determines the steady air-conditioning state or the transition air-conditioning state by a steady state discrimination based on the set temperature and an inside air temperature among the detection value of the thermal load.

24. The air conditioning system according to claim 15, wherein:

the control unit has air-conditioning state determining means for determining whether or not an air conditioning state of the passenger compartment is in the steady air-conditioning state or in the transition air-conditioning state; and

the air-conditioning state determining means determines the steady air-conditioning state or the transition air-conditioning state by a steady state discrimination based on the set temperature, an inside air temperature, and a seat set temperature set by a passenger on the seat.

25. The air conditioning system according to claim 24, wherein the air-conditioning state determining means changes a determining value of the steady state discrimination in accordance with a change of the seat set temperature.

26. The air conditioning system according to claim 24, wherein:

the seat set temperature is set by a seat operation member operating the seat air conditioning unit; and

the seat set temperature is a thermal sensation level of a seat surface, which is changed in a range between a cold level and a hot level.

27. The air conditioning system according to claim 15, wherein:

the control unit includes air-conditioning switching control means which gradually changes the seat control value from a value corresponding to the transition air-conditioning state to a value corresponding to the steady air-conditioning state, at an initial time of the steady air-conditioning state, immediately after the transition air-conditioning

state.

28. The air conditioning system according to claim 1, wherein:

the seat air conditioning unit includes

a seat air conditioning case defining a seat air passage through which at least one of conditioned air from the space air conditioning unit and inside air from the passenger compartment flows toward a seat surface of the seat,

a seat temperature changing member which changes temperature of air blown from the seat surface through the seat air passage,

a seat blower disposed in the seat air passage, for generating an air flow in the seat air passage toward the seat surface, and

a seat temperature setting member which sets a thermal sensation level of the seat surface to a desired thermal sensation level;

the control unit has operation state determining member for determining an operation state of the passenger compartment; and

the control unit controls the seat temperature changing member and the seat blower to obtain the desired thermal sensation level of the seat surface, in the operation state of the space air conditioning unit.

29. The air conditioning system according to claim 15, wherein:

the seat air conditioning unit includes

a seat air conditioning case defining a seat air passage through which at least one of conditioned air from the space air conditioning unit and inside air from the passenger compartment flows toward a seat surface of the seat,

a seat temperature changing member which changes temperature of air blown from the seat surface through the seat air passage,

a seat blower disposed in the seat air passage, for generating an air flow in the seat air passage toward the seat surface, and

a seat temperature setting member which sets a thermal sensation level of the seat surface to a desired thermal sensation level;

the control unit has operation state detecting means for detecting an operation state of the space air conditioning unit; and

the control unit controls the seat temperature changing member and the seat blower to obtain the desired thermal sensation level of the seat surface, in the operation state of the space air conditioning unit.

30. A seat air conditioning unit provided in a vehicle seat of a passenger compartment, the seat air

conditioning unit comprising:

a seat air conditioning case defining a seat air passage through which air flows toward a seat surface of the seat;

a seat temperature changing member which changes temperature of air blown from the seat surface through the seat air passage;

a seat blower disposed in the seat air passage, for generating an air flow in the seat air passage toward the seat surface;

a seat temperature setting member which sets a thermal sensation level of the seat surface to a desired thermal sensation level;

operation state detecting means for determining an operation state of a space air conditioning unit which adjust air to be blown into the passenger compartment; and

seat control means which controls the seat temperature changing member and the seat blower to obtain the desired thermal sensation level of the seat surface, in the operation state of the space air conditioning unit.

31. The seat air conditioning unit according to claim 30, wherein:

the seat control means determines a cooling/heating mode of the space air conditioning unit based on the operation state of the passenger compartment, detected by the operation state detecting means; and

the seat control means controls the seat temperature changing member and the seat blower to obtain the desired thermal sensation level of the seat surface, in the determined cooling/heating mode.

32. The seat air conditioning unit according to claim 30, wherein:

the seat control means estimates a seat temperature of air to be blown toward the seat surface based on the operated state of the passenger compartment detected by the operation state detecting means; and

seat control means controls the seat temperature changing member and the seat blower to obtain the desired thermal sensation level of the seat surface, in accordance with the estimated seat temperature.

33. The seat air conditioning unit according to claim 30, wherein:

the seat control means estimates a space temperature of air to be blown from the space air conditioning unit into the passenger compartment based on the operated state of the passenger compartment detected by the operation state detecting means, and estimates a seat temperature of air to be blown toward the seat surface based on the estimated space temperature; and

seat control means controls the seat temperature changing member and the seat blower to obtain the desired



thermal sensation level of the seat surface, in accordance with the estimated seat temperature.

34. The seat air conditioning unit according to claim 30, wherein seat control means controls the seat temperature changing member and the seat blower to obtain the desired thermal sensation level of the seat surface, using a relationship between the thermal sensation level and at least one of a temperature of air blown from the seat surface, an air amount blowing toward the seat surface, a flow rate of air blowing toward the seat surface.

35. The seat air conditioning unit according to claim 30, wherein the temperature adjustment member includes

a first suction port through which conditioned air from a space air conditioning unit is introduced,

a second suction port through which inside air from the passenger compartment is introduced, and

a switching door which changes an opening degree ratio between the first suction port and the second suction port.

36. The seat air conditioning unit according to claim 30, wherein the temperature adjustment member includes a cooling/heating member disposed in the seat air passage for cooling or heating temperature of air to be blown toward the seat surface.